

WHAT IS CLAIMED:

1. A process for converting a feedstock into at least one useful material, comprising:
preparing a slurry from the feedstock;
reacting the slurry in a first reaction to produce a reacted feed comprising at least one reacted solid product, at least one reacted liquid product, and water;
separating said at least one reacted solid product, said water, and said at least one reacted liquid product from said reacted feed; and
converting said at least one reacted liquid product into at least one useful material in a second reaction.
2. The process of claim 1 wherein said at least one useful material is carbon solids.
3. The process of claim 1 wherein said at least one useful material comprises a mixture of hydrocarbons.
4. The process of claim 3 wherein said mixture of hydrocarbons comprises a fuel gas and an oil.
5. The process of claim 1 wherein said preparing comprises driving off ammonia from said feedstock.
6. The process of claim 1 wherein said first reaction takes place at a pressure of about 20–120 atmospheres.
7. The process of claim 6 wherein said pressure is about 50 atmospheres.
8. The process of claim 1 wherein said first reaction takes place at a temperature in the range about 150 °C to about 330 °C.
9. The process of claim 1 wherein said reacting drives off at least one contaminant.
10. The process of claim 9 wherein said at least one contaminant is a sulfur-containing material.

11. The process of claim 9 wherein said at least one contaminant is a mercury-containing material.
12. The process of claim 9 wherein said at least one contaminant is a halogen-containing compound.
13. The process of claim 1 wherein said reacting drives off steam.
14. The process of claim 13 wherein said steam is redirected to heat said slurry during said preparing.
15. The process of claim 1 wherein said separating comprises a first separation and a second separation.
16. The process of claim 1 wherein said at least one liquid product comprises at least one fat derivative or fatty acid.
17. The process of claim 1 wherein said at least one solid product comprises at least one mineral compound.
18. The process of claim 1 further comprising, prior to said converting, diverting a portion of said at least one liquid product and separately converting said portion into at least one specialty chemical.
19. The process of claim 18 wherein said at least one specialty chemical comprises a fatty acid.
20. The process of claim 1 wherein said second reaction takes place at a temperature in the range about 400 °C to about 600 °C.
21. The process of claim 1 wherein said at least one useful material is pathogen-free.
22. The process of claim 1 wherein said feedstock comprises rubber materials.
23. The process of claim 22 wherein said feedstock comprises one or more tires.

24. The process of claim 1 wherein said feedstock comprises municipal sewage sludge.
25. The process of claim 1 wherein said feedstock comprises food processing waste.
26. The process of claim 25 wherein said food processing waste comprises turkey offal.
27. The process of claim 1 wherein said feedstock comprises mixed plastics.
28. The process of claim 1 wherein said feedstock comprises PVC.
29. The process of claim 28 wherein said first reacting drives off at least one chlorine - containing contaminant.
30. The process of claim 1 wherein said feedstock comprises animal manure.
31. The process of claim 1 wherein said feedstock comprises one or more byproducts of food manufacture and distribution selected from the group consisting of: turkey offal, fryer oils, corn stalks, rice hulls, waste scraps, and last-press edible oils.
32. The process of claim 31 wherein said last-press edible oil is selected from the group consisting of: canola, soybean, palm, coconut, rape seed, cotton seed, corn, and olive oil.
33. The process of claim 1 wherein said feedstock is selected from the group consisting of: by-products of paper and other wood industry manufacturing, paper-pulp effluent, and black liquor.
34. The process of claim 33 wherein said byproducts of paper manufacturing comprise cellulose or lignin containing materials.
35. The process of claim 1 wherein said feedstock is selected from the group consisting of: leaves, grass clippings, bagasse, seaweed, cotton waste, and animal waste.
36. The process of claim 1 wherein said feedstock is selected from the group consisting of: plastic bottles, old computers, and municipal solid waste.
37. The process of claim 1 wherein said feedstock is selected from the group consisting of: oil-refinery residues, shale oil, and drilling mud.

38. The process of claim 1 wherein said feedstock is selected from the group consisting of: harbor-dredged sediments, industrial sludges, milling waste, coal refinery wastes, and tar sands.
39. The process of claim 1 wherein said feedstock is selected from the group consisting of: anthrax spores, infectious medical waste, and biological pathogens.
40. The process of claim 1 wherein said at least one useful material is a carbonaceous material.
41. The process of claim 40 wherein the carbonaceous material is depleted of mercury-containing contaminants.
42. The process of claim 40 wherein the carbonaceous material is depleted of sulfur-containing contaminants.
43. A fuel oil manufactured by the process of claim 1.
44. The fuel oil of claim 43, wherein said fuel oil is a #2 heating oil.
45. The fuel oil of claim 43 having a composition by weight of: about 22% paraffins, about 14% olefins, about 3% naphthenes, about 6% aromatics, and about 55% C₁₄/C₁₄⁺.
46. The fuel oil of claim 43 having the following properties: a cloud point of about -10 °C; a pour point of about -20 °C; a cetane index of about 40; and a heat content of about 18,800 BTU/lb.
47. A fuel oil manufactured by a process, comprising:
preparing a slurry from a carbon-containing feedstock;
reacting the slurry in a first reaction to produce a reacted feed comprising at least one reacted solid product, at least one reacted liquid product, and water;
separating said at least one reacted solid product, said water, and said at least one reacted liquid product from said reacted feed;
converting said at least one reacted liquid product into the fuel oil in a second reaction.
48. A process for converting a feedstock into at least one useful material, comprising:
preparing a slurry from the feedstock;

passing the slurry through a heat exchanger, wherein one or more gases is vented, to produce a conditioned slurry;
reacting the conditioned slurry in a first reaction, wherein steam and gas is liberated, to produce a reacted feed comprising at least one reacted solid product, at least one reacted liquid product, and water, wherein the reacted solid product comprises at least one mineral;
lowering a temperature, and lowering a pressure, of the reacted feed, to produce an intermediate feed;
separating the at least one mineral from the intermediate feed, thereby producing a mixture comprising at least one reacted liquid product, and water;
diverting said water to storage;
subjecting said at least one reacted liquid product to a second reaction wherein carbon solids and a mixture of hydrocarbon vapor and gases are produced.

49. An apparatus for converting a feedstock into at least one useful material, comprising:
a pre-treatment unit for producing a heated slurry from the feedstock;
a first stage reactor communicating with said vessel to receive said heated slurry, said first stage reactor configured to subject said heated slurry to a first increased temperature and a first increased pressure to produce a reacted feed that comprises at least one reacted solid product, at least one reacted liquid product, and water;
at least one second stage separation unit communicating with the first stage reactor to receive the at least one solid product, at least one liquid product, and water, said unit configured to separate out said at least one reacted solid product, said water, and said at least one reacted liquid product; and
a third stage reactor communicating with the separation unit to receive said at least one reacted liquid product, said third stage reactor configured to subject the at least one reacted liquid product to a second increased pressure and a second increased temperature, thereby converting the at least one reacted liquid product to at least one useful material.
50. The apparatus of claim 49 wherein the pre-treatment unit comprises:
a feedstock preparation unit, including a slurring device to create a feedstock slurry from the feedstock;
a vessel communicating with the feedstock preparation unit to receive the feedstock slurry from said feedstock preparation unit, a pump configured to pressurize said slurry, and a heat exchanger configured to heat said slurry, to produce the heated slurry.

51. The apparatus of claim 49 wherein the first increased pressure is about 20–120 atmospheres.
52. The apparatus of claim 49 wherein said pressure is about 50 atmospheres.
53. The apparatus of claim 49 wherein said first reaction takes place at a temperature in the range about 150 °C to about 330 °C.
54. The apparatus of claim 49 wherein the first stage reactor additionally drives off steam that is redirected to the feedstock preparation unit.
55. The apparatus of claim 49 further comprising a unit for receiving a portion of the at least one reacted liquid product and converting said portion into at least one specialty chemical.
56. The apparatus of claim 49 wherein the second increased temperature is between about 400 °C and about 600 °C, and the second increased pressure is about 15 to about 50 psi above atmospheric pressure.
57. The apparatus of claim 49 configured to accept a feedstock comprising rubber materials.
58. The apparatus of claim 49 wherein said feedstock comprises one or more tires.
59. The apparatus of claim 49 configured to accept a feedstock comprising food processing waste.
60. The apparatus of claim 49 configured to accept a feedstock comprising mixed plastics.
61. The apparatus of claim 49 configured to accept a feedstock comprising municipal sewage sludge.
62. The apparatus of claim 49 further comprising a storage unit for the at least one useful material.
63. The apparatus of claim 49 wherein the at least one useful material comprises carbon solids.

64. The apparatus of claim 49 wherein the at least one useful material comprises a mixture of hydrocarbons.
65. A process for converting tires into oil, comprising:
dissolving the tires in a solvent;
preparing a slurry from the tires;
reacting the slurry with water in a first reaction to produce a reacted feed comprising at least one reacted solid product, at least one reacted liquid product;
separating said at least one reacted solid product, said water, and said at least one reacted liquid product from said reacted feed;
converting said at least one reacted liquid product into oil in a second reaction.
66. The process of claim 65 wherein the first reaction takes place at a temperature between about 250 °C and about 400 °C.
67. The process of claim 65 wherein the second reaction takes place at a temperature between about 300 °C and about 525 °C.
68. The process of claim 65 wherein the solvent is oil obtained from said converting.
69. A process for converting mixed plastics into at least one useful material, comprising:
preparing a slurry from the mixed plastics;
reacting the slurry with water in a first reaction to produce a reacted feed comprising at least one reacted solid product, at least one reacted liquid product;
separating said at least one reacted solid product, said water, and said at least one reacted liquid product from said reacted feed;
converting said at least one reacted liquid product into at least one useful material in a second reaction.
70. The process of claim 69 wherein the first reaction takes place at a temperature between about 200 °C and about 250 °C.

71. The process of claim 69 wherein the second reaction takes place at a temperature between about 300 °C and about 525 °C.

72. A process for converting municipal sewage sludge into at least one useful material, comprising:

- preparing a slurry from the municipal sewage sludge;
- reacting the slurry in a first reaction to produce a reacted feed comprising at least one reacted solid product, and at least one reacted liquid product, and water;
- separating said at least one reacted solid product, said water, and said at least one reacted liquid product from said reacted feed;
- converting said at least one reacted liquid product into at least one useful material; and
- in a second reaction, converting said at least one solid product into a mixture of hydrocarbon oils, fuel gas and a mixture of minerals and carbon.

73. The process of claim 72 wherein the first reaction takes place at a temperature between about 170 °C and about 250 °C.

74. The process of claim 72 wherein the second reaction takes place at a temperature between about 300 °C and about 525 °C.

75. A process for converting turkey offal into at least one useful material, comprising:

- preparing a slurry from the turkey offal;
- reacting the slurry in a first reaction to produce a reacted feed comprising at least one reacted solid product, and at least one reacted liquid product, and water;
- separating the at least one reacted solid product, the water, and the at least one reacted liquid product from the reacted feed; and
- in a second reaction, converting the at least one reacted liquid product into a mixture of hydrocarbon oils, fuel gas, and carbon.

76. The process of claim 75 wherein the first reaction takes place at a temperature between about 150 °C and about 330 °C.

77. The process of claim 75 wherein the second reaction takes place at a temperature between about 300 °C and about 525 °C.
78. The process of claim 75 wherein the first reaction takes place at about 250 °C.
79. The process of claim 75 wherein the first reaction takes place at a pressure of 20–120 atmospheres
80. The process of claim 75 wherein the first reaction takes place at a pressure of about 50 atmospheres.